

Remarks

The Office Action mailed October 20, 2004 has been carefully reviewed and the following remarks have been made in consequence thereof.

Claims 3-8, 10-11, 13-17, and 20-26 are now pending in this application, with entry of this amendment. Claims 1-25 stand rejected. With entry of this Amendment, Claims 1, 2, 9, 12, 18 and 19 are cancelled.

No extension of time is believed necessary for entry of this Amendment. However, the Commissioner is hereby authorized to consider this a request for the necessary extension of time, if one is needed, and to charge the fee for this extension and any other fees necessary for entry of this Amendment (including fees for additional claims, if the amount authorized on the Transmittal is insufficient) to the Deposit Account indicated in the accompanying Transmittal.

The rejection of Claims 1-25 under 35 U.S.C. § 102(b) as being anticipated by Arz et al. is respectfully traversed.

Arz et al. discloses a switchable gradient coil for an MRI apparatus. The coil includes a number of independently drivable coil elements, which can be driven individually or in winding packets. The coil system is said to have selectable performance features, among which are linearity volume (see col. 2, line 39). Arz et al. state that the circuit arrangement for the connecting of the windings and winding packets with one another, as desired, so as to correspond to the desired performance features can be designed such that the performance features are statically fixed and connected before a sequence operation or such that the performance features are dynamically switchable during a sequence operation, col. 2, lines 47-53. However, with respect to the reversal of current direction, Arz et al. state only that the ability to reverse the current direction is also one of the different optional connecting possibilities of the individual windings and winding packets, which, among other things (which are not detailed in Arz et al.), enables a connectable Lorentz force compensation. See

col. 2, lines 43-46. Thus, Arz et al. do not teach for which features, other than a connectable Lorentz force compensation, currents in the disclosed coils are reversed. More particularly, Arz et al. do not teach or suggest a method for selecting currents in windings by which reversing a current in a second coil winding produces a change from a small imaging volume with a field B1 to a large imaging field with a field B2.

Moreover, in the only examples disclosed by Arz et al. in which some windings have current traversed by current in one direction while others have windings traversed by current in the opposite direction, all windings exhibit the same diameter. See col. 4, lines 35-50. These are apparently the examples to which Claim 2 of Arz et al. is drawn. Nowhere does Arz et al. teach or suggest P1 and S1 are primary and shield radii for the first coil, P2 and S2 are primary and shield radii for the second coil, and $P1 < P2 < S1 < S2$.

Furthermore, Arz et al. describe only a switchable Z-gradient coil of the type used for MR imaging. Nowhere do Arz et al. mention any kind of computer-readable medium or a computer.

By contrast, Claim 3, as herein amended to incorporate the features originally found in Claims 1, 2, and 3, recites, "A method of operating a magnetic resonance imaging system having a first coil having a field C1 and a second coil having a field C2 to achieve imaging volumes, said method comprising: in a first mode, achieving a small imaging volume by using a sum field from both of the coils; and in a second mode, achieving a large imaging volume by using a difference field from both of the coils; reversing the magnetic field from the second coil to change from the first mode to the second mode; wherein a field for the small imaging volume is B1, and a field for the large imaging volume is B2, said method comprising selecting C1 and C2 such that $C1 + C2 = B1$, and $C1 - C2 = B2$." Nowhere does Arz et al. teach or suggest which features, other than a connectable Lorentz force compensation, current in the disclosed coils are reversed, nor do Arz et al. teach or suggest a method for selecting currents in windings by which reversing a current in a second coil winding produces a change from a small imaging volume with a field B1 to a large imaging field with a field B2. Thus, it is submitted that Claim 3 is patentable over Arz et al.

Claim 8, as herein amended, is dependent upon Claim 3. When the recitations of Claim 8 are considered in combination with the recitations of Claim 3, it is submitted that Claim 8 is likewise patentable over Arz et al.

Also, Claim 4, as herein amended, has been rewritten as an independent claim. Claim 4 recites, among other things, “wherein P1 and S1 are primary and shield radii for the first coil, P2 and S2 are primary and shield radii for the second coil, and $P1 < P2 < S1 < S2$, said method comprising achieving the current density for a small imaging volume coil by assuming that the primary and shield radii are P2 and S1 respectively and denoting the current density by D1.” Arz et al. teach only a set of coils having equal radii wherein some coils have their current reversed, and do not teach or suggest Applicant's claimed relationship between coils and their primary and shield radii. For this reason, it is submitted that Claim 4 is also patentable over Arz et al.

Claims 5-7 and 26 are dependent directly or indirectly upon Claim 4. When the recitations of Claims 5-7 and 26 are considered in combination with the recitations of Claim 4, it is submitted that Claims 5-7 and 26 are likewise patentable over Arz et al.

This rejection no longer applies to Claims 9 and 12, which have both been cancelled.

Claim 13 has been amended to incorporate the features formerly in Claims 9 and 12. Claim 13 is directed to a Magnetic Resonance Imaging system (MRI) “... further configured to reverse the magnetic field of the second coil in the second mode compared to the first mode, and wherein a field for the small imaging volume is B1, and a field for the large imaging volume is B2, a field from said first coil is denoted as C1 and a field from said second coil is denoted as C2, and C1 and C2 are selected such that $C1 + C2 = B1$, and $C1 - C2 = B2$.” As stated above, nowhere does Arz et al. teach or suggest which features, other than a connectable Lorentz force compensation, current in the disclosed coils are reversed, nor do Arz et al. teach or suggest a method for selecting currents in windings by which reversing a current in a second coil winding produces a change from a small imaging volume

with a field B1 to a large imaging field with a field B2. Thus, it is submitted that Claim 13 is patentable over Arz et al.

Claims 10 and 11 are dependent directly or indirectly upon Claim 13. When the recitations of Claims 10 and 11 are considered in combination with the recitations of Claim 13, it is submitted that Claims 10 and 11 are likewise patentable over Arz et al.

Claim 14, as herein amended, has been rewritten as an independent claim. Claim 14 recites, among other things, "wherein P1 and S1 are primary and shield radii for said first coil, P2 and S2 are primary and shield radii for said second coil, and $P1 < P2 < S1 < S2$, the current density is achieved for a small imaging volume coil by assuming that the primary and shield radii are P2 and S1 respectively and denoting the current density by D1." Arz et al. teach only a set of coils having equal radii wherein some coils have their current reversed, and do not teach or suggest Applicant's claimed relationship between coils and their primary and shield radii. For this reason, it is submitted that Claim 14 is also patentable over Arz et al.

Claims 15-17 depend directly or indirectly upon Claim 14. When the recitations of Claims 15-17 are considered in combination with the recitations of Claim 14, it is submitted that Claims 15-17 are likewise patentable over Arz et al.

This rejection does not apply to Claims 18 and 19, which have been cancelled.

Claim 20, as herein amended, has been rewritten as an independent claim, incorporating the features formerly recited in Claims 18, 19, and 20. Claim 20, as herein amended, recites features similar to Claim 3, as herein amended, and it is therefore submitted that Claim 20 is patentable over Arz et al. for similar reasons.

Claims 21 and 22 depend directly or indirectly upon Claim 20. When the recitations of Claims 21 and 22 are considered in combination with the recitations of Claim 20, it is submitted that Claims 21 and 22 are likewise patentable over Arz et al.

Claim 23 recites, “[a] computer readable medium encoded with a program configured to instruct a computer to...”. It is respectfully submitted that Arz et al. do not teach or suggest any computer readable medium or any program, as no mention is made anywhere in Arz et al. of any computer or any computer readable medium. Moreover, to the extent that the Office may elect to argue that the features of the claim are limited to the two paragraphs in Claim 23 beginning with the word “energize,” it is submitted that the preamble to Claim 23 breathes life into the claim, or in the alternative, that the preamble ends with the word “medium,” as a recited limitation of the “computer readable medium” is that it is “encoded with a program” that is configured in a particular way. There being nothing in Arz et al. to teach or suggest such a medium, it is submitted that Claim 23 is patentable over Arz et al. Furthermore, such a medium is not inherent in the teachings of Arz et al., inasmuch as an MRI machine need not include a computer readable medium. Even if an MRI machine of the types referred to in Arz et al. have a computer, the MRI machine need not use a computer or a machine readable medium encoded with instructions to energize the coils in a first mode and to energize the coils in a second mode. For example, manual switches could be used to select the modes in which the coils are energized. Thus, it is submitted that Claim 23 is patentable over Arz et al.

Claim 24 is dependent upon Claim 23. When the recitations of Claim 24 are considered in combination with the recitations of Claim 23, it is submitted that Claim 24 is likewise patentable over Arz et al.

Claim 25 recites, “[a] computer configured to receive a mode indication including a small mode and a large mode; energize a first coil and a second coil in a first mode ... and energize the first coil and the second coil in a second mode ...”. As is the case with Claim 25, it is submitted that the preamble breathes life into the claim and distinguishes the structure of Claim 25 from any taught or suggested by Arz et al. in that Arz et al. do not mention any computer. Moreover, nothing in Arz et al. teaches or suggests receiving a mode indication including a small mode and a large mode – certainly the coil taught therein is not a structure that “receives” a mode indication and that also “energizes” a first coil and a second coil. In addition, there is nothing inherent in the teachings of Arz et al. to require the use of a

computer to perform these steps. At col. 2, lines 47-53, all that is said is that the circuit arrangement can corresponding to the desired performance features and that the circuit can be designed such that the performance features are statically fixed and connected before a sequence operation or such that the performance features are dynamically switchable during a sequence operation. It is submitted that such switching does not inherently require a computer, and that it may, instead, be done manually using mechanical switches. For these reasons, it is submitted that Claim 25 is patentable over Arz et al.

For the above reasons, it is respectfully requested that the rejection of Claims 1-25 under 35 U.S.C. § 102(b) as being anticipated by Arz et al. be withdrawn.

Claim 26 is new. Its patentability is considered in conjunction with Claim 4 above, from which it is indirectly dependent. It is further submitted that the additional feature added by Claim 26 (see paragraph [0032]) is also new and non-obvious in the claimed combination over the cited prior art.

In view of the foregoing amendments and remarks, all the claims now active in this application are believed to be in condition for allowance. Reconsideration and favorable action is respectfully solicited.

Respectfully Submitted,



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